USC Viterbi
School of Engineering

The USC GamePipe Laboratory

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USC GamePipe Laboratory
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The USC GamePipe Laboratory Mission

The mission of the USC GamePipe Laboratory is research, development & education on technologies & design for the future of interactive games & their application.

- from developing the supporting technologies for increasing the complexity & innovation in produced games,
- to developing serious & entertainment games for government & corporate sponsors.

GAME PIPE

Game Development Degree Programs

BS in Computer Science (Games)

- The goal of the BS degree is to educate students capable of engineering next generation games immediately upon graduation. Students in this program receive a solid grounding in Computer Science in addition to the art and design required for functioning in the game industry.

MS in Computer Science (Game Development)

- The goal of the MS degree is to graduate professionally educated students capable of engineering next generation games and their required technologies.

Degrees started Fall 2006.

We are in our fourth semester of operation.

BS in Computer Science (Games)

Core Requirements (43 units)

Computer Science (37 units)
Programming & Software Development
CSCI 101 (3) Fundamentals of Computer Programming
CSCI 102 (4) Data Structures
CSCI 105 (2) Object-Oriented Programming (C++ version)
CSCI 201 (4) Principles of Software Development (C++ version)
CSCI 377 (3) Introduction to Software Engineering
Theory
CSCI 271 (3) Discrete Methods in Computer Science
CSCI 303 (3) Design & Analysis of Algorithms
Hardware & Systems
CSCI 402 (3) Operating Systems
EE 450 (3) Intro to Computer Networks
CS/EE 352 (3) Computer Organization & Architecture
Autonomy & Immersion
CSCI 460 (3) Artificial Intelligence
CSCI 480 (3) Computer Graphics

General Education (20 units)

Science (4 credits)
PHYS 151LG (4) Fund. Of Physics I: Mechanics & Thermodynamics

Writing (7 credits)
WRIT 140 (4) Writing and Critical Reasoning
WRIT 340 (3) Advanced Writing

Math (12 credits max)
MATH 125 (4) Calculus I
MATH 126 (4) Calculus II
MATH 225 (4) Linear Algebra/Diff. Equations or EE 241 (3) Applied Linear Algebra for Engineering
Highly recommended
MATH 226 (4) Calculus III
EE 364 (3) Introduction to Probability and Statistics for Electrical Engineering

Game Development

Game Engineering (11 units)

CSCI/ITP 380 (4) Videogame Programming
CSCI/EE 452 (3) Game Hardware Architectures
CSCI 487/ITP 485 (4) Programming Game Engines

Game Design (8 units)

CTIN 488 (4) Game Design Workshop
CTIN 484 (2) Intermediate Game Development
CTIN 489 (2) Intermediate Game Design Workshop

Technical Electives (6 units)

Game Cross-Disciplinary (23 units)

CSCI 180 (3) Survey of Digital Games & Their Technologies
CSCI 280/ITP 280x (4) Videogame Production (Individual Projects)
CSCI 281 (3) Pipelines for Games & Interactives
CTAN 443 (2) 3D Animation & Character Animation
CTAN 452 (2) Intro to Computer Animation
CSCI 486 (3) Serious Games Development
CSCI 491a (4) Final Game Projects
CSCI 491b (2) Final Game Projects

Figure 1 BS in Computer Science (Games)

Version 8.3

http://gamepipe.usc.edu/Masters.html

MS in Computer Science (Game Development)

CS Core (9 credits)
You must take the following two courses:
CS 570 Analysis of Algorithms
CS 580 3D Computer Graphics & Rendering
You must take one of the following courses:
CS 555 Advanced Operating Systems
CS 561 Artificial Intelligence
(or CS 573 Advanced Artificial Intelligence)
CS 571 Web Technologies
CS 577a Software Engineering
CS 585 Database Systems
EE 557 Computer Systems Architecture

Game Development Core (11 credits)
CTIN 488 Game Design Workshop (4)
CS 522 Game Engine Development (4)
EE/CS 452 Game Hardware Architectures

Electives - choose a concentration area & Complete Two Classes in That Area
(6 credits)
Infrastructure
Cognition & Games
Immersion
Serious Games

Project Classes (7 credits)
CSCI 529a Advanced Game Projects (4)
CSCI 529b Advanced Game Projects (3)
(take in semester 3 and 4)

Infrastructure
CS 503 Parallel Programming
CS 520 Computer Animation & Simulation
CS 523 Networked Games - Design & Implementation
CS 524 Networked AI
CS 526 Advanced Mobile Devices & Game Consoles

Cognition & Games
CS 524 Networked AI
CS 534 Affective Computing
CS 535 Game Based Learning
CS-541 AI Planning
CS 543 Software Multiagent Systems
CS 569 Integrated Intelligent Systems
CS-573 Advanced AI

Immersion
CS 520 Computer Animation & Simulation
CS 523 Networked Games - Design & Implementation
CS 537 Immersive Environments
CS 538 Human Performance Engineering
CS 574 Computer Vision
CS 588 Specification & Design of UI Software
CTAN 502A Virtual Reality & Stereoscopic Animation
EE 619 Advanced Topics in Speech Recognition & Spoken Language Engineering

Serious Games
CS 486 Serious Games Development
CS 520 Computer Animation & Simulation
CS 535 Game Based Learning
CS 537 Immersive Environments
CS 538 Human Performance Engineering

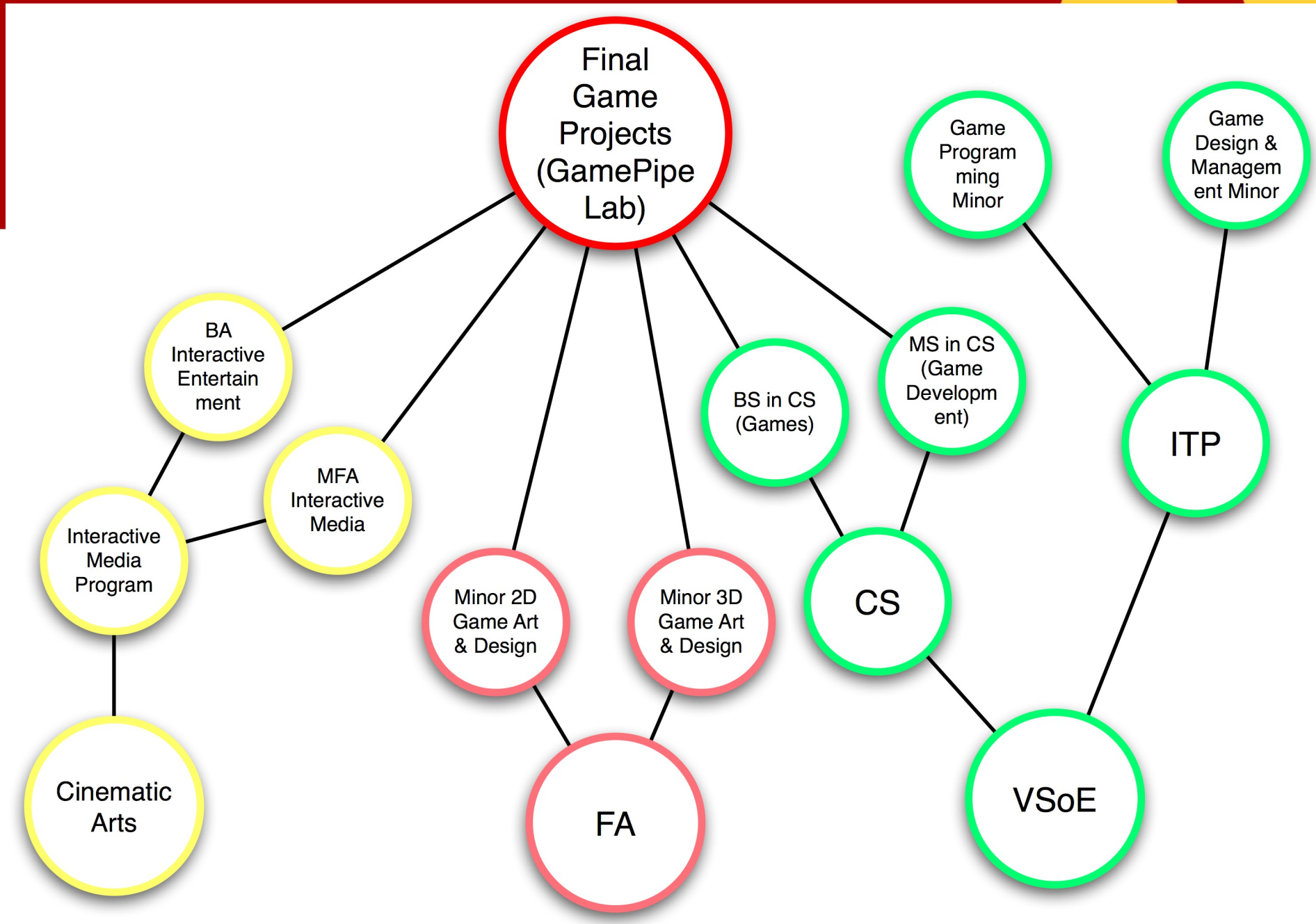
Total (33 credits)

Interdisciplinary Nature of the BS/MS in Computer Science (Games) Programs

We have embedded the full game production process into the degree program ...

- from building 3D models,
- to MOCAP,
- to game animation,
- to game engine development & utilization,
- to game design & prototype development for serious & entertainment purpose.

We can build serious & entertainment games & innovative game technology using our student base, providing them real-world understanding of game development.


Final Game Projects (GamePipe Lab)
Game Programming Minor
Game Design & Management Minor
BA Interactive Entertainment
MFA Interactive Media
BS in CS (Games)
MS in CS (Game Development)
ITP
Interactive Media Program
Minor 2D Game Art & Design
Minor 3D Game Art & Design
CS
Cinematic Arts
FA
VSoE

Interdisciplinary Nature of the BS/MS in Computer Science (Games) Programs

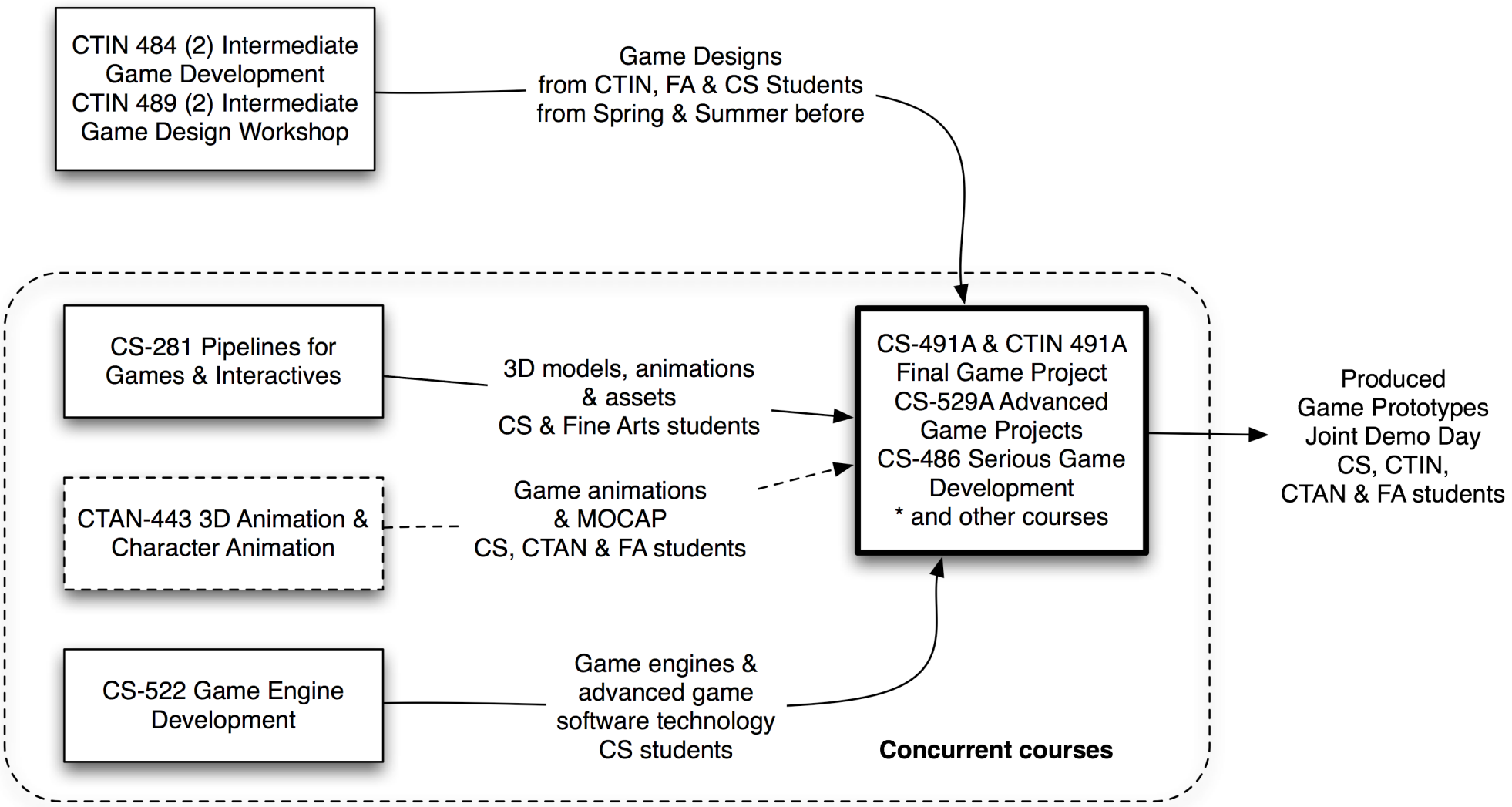

CTIN 484 (2) Intermediate Game Development
CTIN 489 (2) Intermediate Game Design Workshop
Game Designs from CTIN, FA & CS Students from Spring & Summer before
CS-281 Pipelines for Games & Interactives
3D models, animations & assets CS & Fine Arts students
CTAN-443 3D Animation & Character Animation
Game animations & MOCAP CS, CTAN & FA students
CS-522 Game Engine Development
Game engines & advanced game software technology CS students
CS-491A & CTIN 491A Final Game Project CS-529A Advanced Game Projects CS-486 Serious Game Development * and other courses
Produced Game Prototypes Joint Demo Day CS, CTIN, CTAN & FA students
Concurrent courses

Figure 2 Cross-disciplinary coordination architecture for the Final Game Projects and Advanced Game Projects courses.

*** Other courses utilizing production pipeline:**
CS-523 Networked Games
CS-524 Networked AI
CS-526 Mobile Games

Internship & Placement

April 2007 - we have placed 30 students/graduates into:

- EA LA, EA (Mythic Studios), EA Mobile, EA Pogo
- THQ
- Disney Interactive (formerly Disney Buena Vista Games), Disney VR Studios
- Activision - Central Technology Group
- Blizzard, Apple, Emsense, Big Huge Games, 7 Studios
- Plus students to - Google, Cisco, Ebay, Adobe, Microsoft

Demo Day 18 December 2007 Attendance

Sony Online Entertainment
Sony Computer Entertainment of America
EA - Mobile, LA
Activision
THQ
Digital Domain
Seven Studios
iSportGames
Lockheed Martin
Paramount Digital Entertainment
Disney - Animation, Interactive, & VR Studios
Emsense
Motorola
Applied Minds
Northrup Grumman
Big Stage
Sandia National Labs
Konami
Lucas Arts
Pandemic
Insomniac Games
NaughtyDog

Serious Games & Sponsored Efforts

CS-486 Serious Games Development teaches our students how to build games for serious purpose with an interested sponsor.

- Sponsors provide funding and work directly with the student teams, providing students the experience of working for a well-directed client.
- We had significant funding directed towards CS-486 in the last year, with that funding used to enhance the GamePipe Laboratory & to fund additional student labor for talents not in the CS-486 course.

Assembly

Assembly layout game built for Lockheed Martin Skunk Works as proof-of-principle for serious games.

Sponsor: Lockheed Martin Skunk Works

- donation

ASSEMBLY FORCE
LOCKHEED MARTIN
FOD
A PRODUCTION OF THE USC GAMEPIPE LAB IN COLLABORATION WITH LOCKHEED MARTIN
FRED ZYDA BEN LISBAKKEN DAN HARRIS MIKE HAN
LINDA CHO LIZZIE FINNEGAN JESSE STOKES
PRODUCED BY VICTOR LACOUR
GAMEPIPE

Ground Truth

Ground truth incident commander game built for Sandia National Labs

Sponsor: Sandia National Labs

- Grant & promise of 2 more years of funding

FireScope - Incident Commander

Incident commander training game built for the Los Angeles Fire Department

Funded by DHS through USC CREATE

- Grant

FIRESCOPE
INCIDENT COMMANDER
A COLLABORATION BETWEEN USC GAMEPIPE AND THE LOS ANGELES FIRE DEPARTMENT
PRESS SPACEBAR
THE USC VITERBI SCHOOL OF ENGINEERING AND C.R.E.A.T.E. LABS PRESENT "FIRESCOPE: INCIDENT COMMANDER"
A USC GAMEPIPE GAME PRODUCED BY VICTOR LACOUR AND THE SPRING 2006 CS 499: SERIOUS GAMES CLASS
FEATURING PAMELA FOX FRED ZYDA PATRICK BITONTI THOMAS PREISNER
DAVID FIRESTONE ADAM PODOLNICK JEFF ASHBROOK GREG DAMIANO

Immune Attack

Funded by: National Science Foundation -

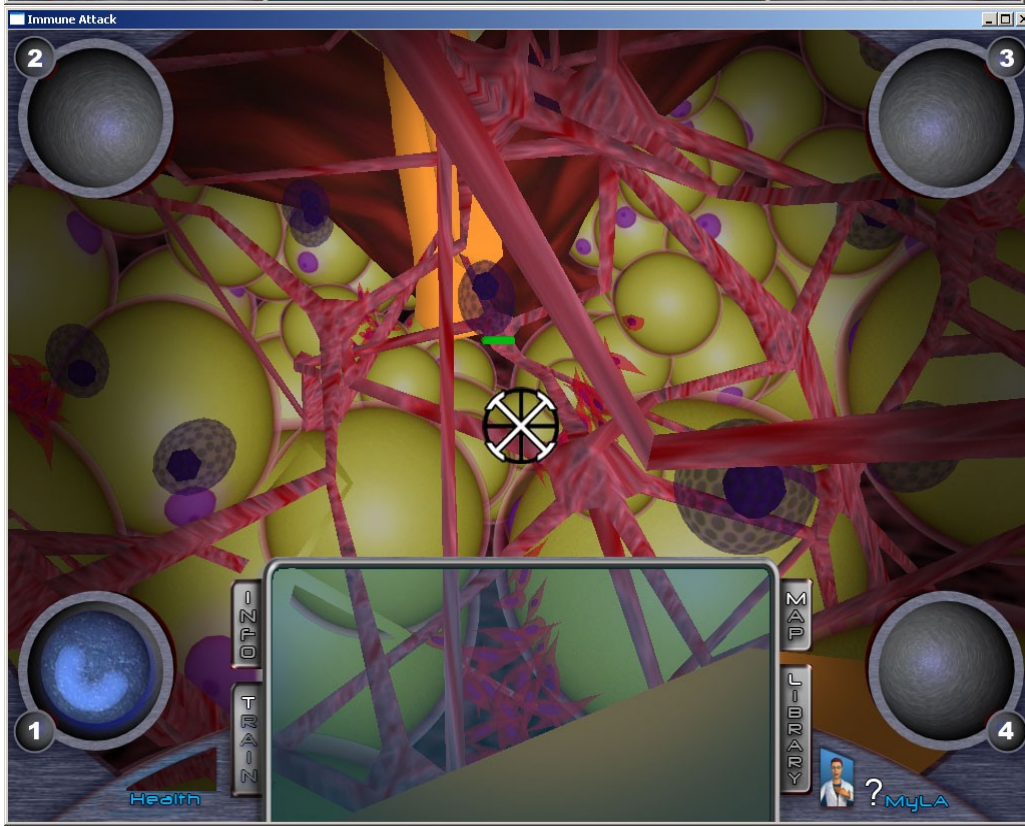
Collaborators:

- Brown University, Federation of American Scientists, USC
- USC's Game Innovation Lab (Cinema)
- USC's GamePipe Lab (Engineering)

Topic: Immunology

Platform: PC

Target Audience: AP biology students



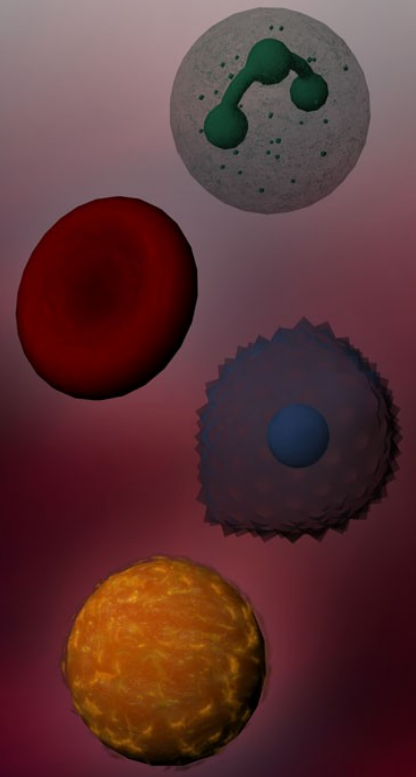
IMMUNE ATTACK

Scanning Mode
Press the 'Space Bar' to Scan
Scanning Mode
Press the 'Space Bar' to Scan
Tractor beam mode
Tractor beam 1 Empty
Press the 'Space Bar' to Activate

No one could ever explain why. Your immune system was present, but could not fight invading pathogens. A single germ, a single infection, would kill you.

Sealed away behind glass walls all your life, you have developed a highly sophisticated nanoprobe to train your own immune cells to resist infection. But to train these cells, you'll have to expose yourself to infectious agents and defeat them, one by one.

If you succeed, you'll live a normal life. If not... you'll die.

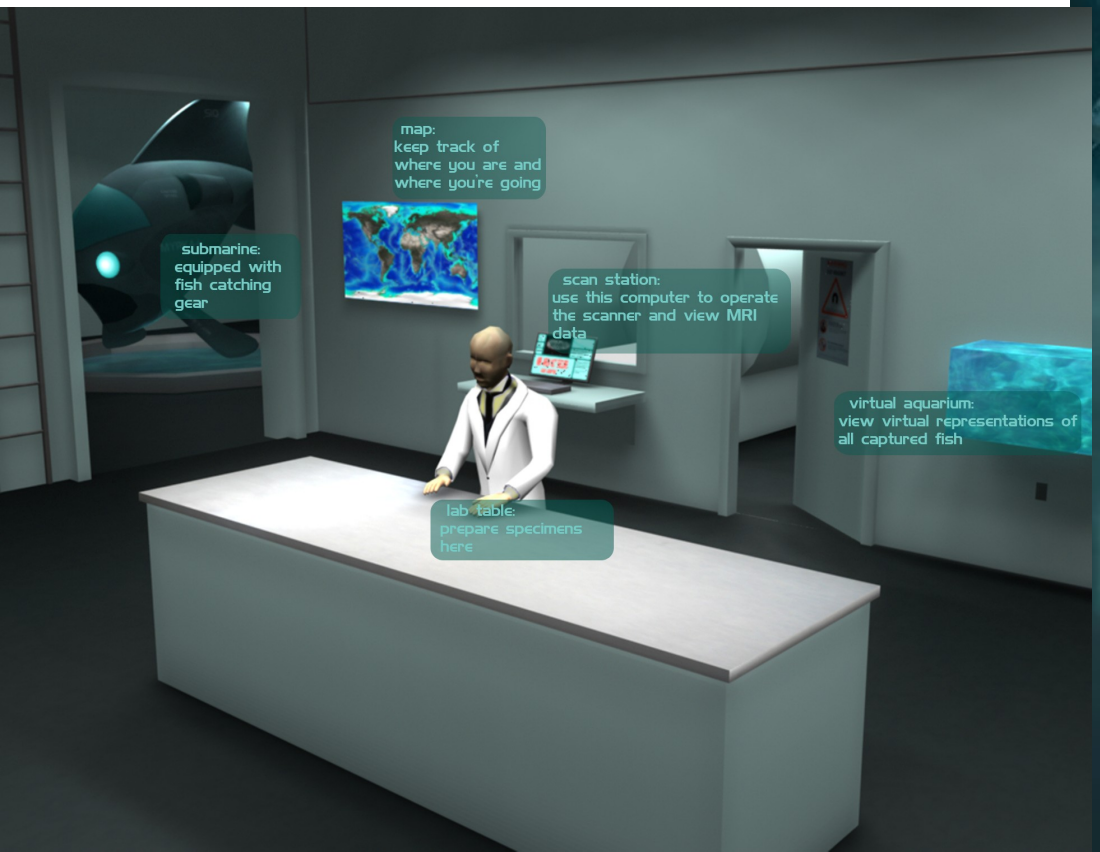


Immune Attack is an educational video game jointly developed by the Federation of American Scientists, Brown University, and the University of Southern California

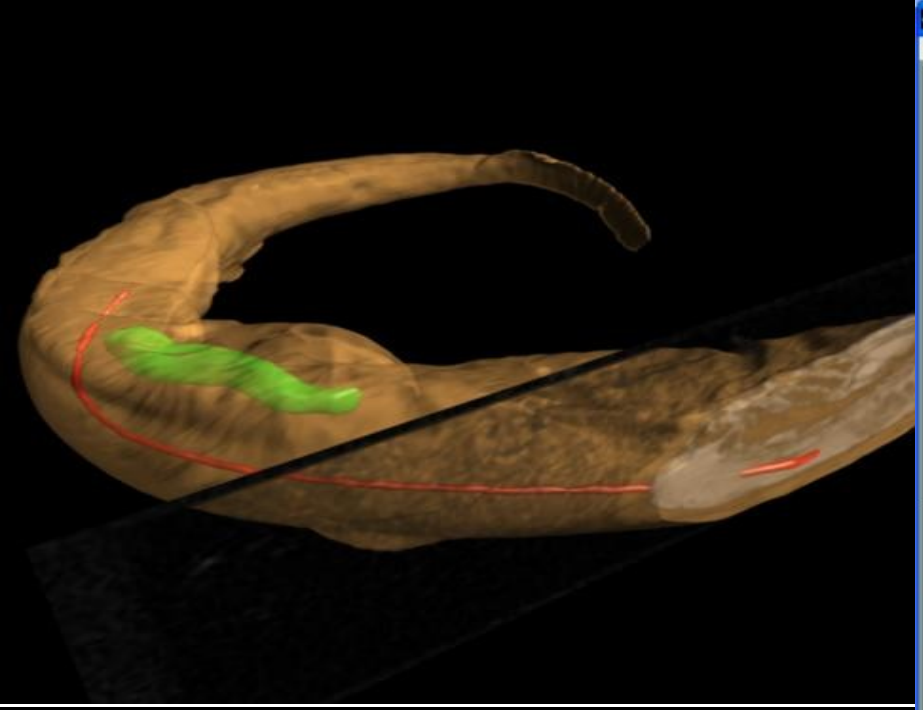
Fish Quest

Funded by NSF

- Grant with UCSD


map:
keep track of where you are and where you're going
submarine:
equipped with fish catching gear
scan station:
use this computer to operate the scanner and view MRI data
virtual aquarium:
view virtual representations of all captured fish
lab table:
prepare specimens here

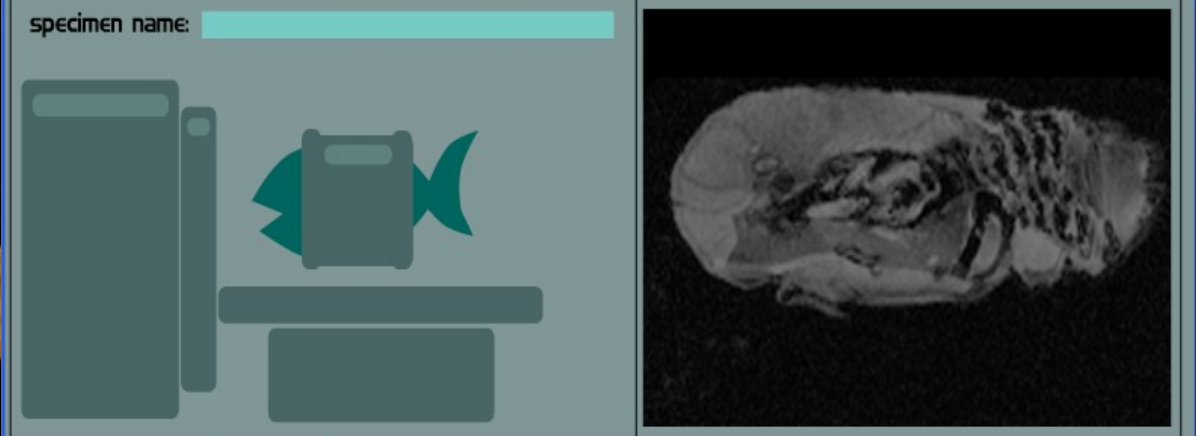
mankind's last hope lies beneath the waves
FISH QUEST
TRAVIS HO JOSEPH HSU HSIN-YI CHENG VIKRAM SHARMA WILL MEYER
the USC VITERBI SCHOOL of ENGINEERING presents a GAMEPIPE production
in assocation with the UCSD School of Medicine and the Scripps Institution of Oceanography
special thanks to Cameron Perry, German Eichberger, HJ Walker,
Phil Hastings, and Lawrence Frank
producer VICTOR LACOUR
made possible by a grant from the National Science Foundation



MRI

File Edit View Insert Tools Desktop Window Help

specimen name:



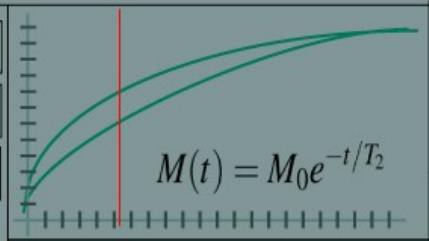
prepare to scan

full scan

segmentation

MRI AREA NOT SECURE

scan aborted



TE: TR:

scan timing

NEX:	TESLA:	IMAGE MATRIX:
1	3	256x256

scanning protocols:

safety considerations:

signal equations:

The MRI scanner produces a 3 tesla strength magnetic field. Metal objects within this field may cause serious injury. This field may also cause serious problems for people with pacemakers, neurostimulators or metallic implants.

For this reason, it is important that the scanning area be sealed when scanning.

equipment and upgrades

lures:

shrimp	$10
anchovy	$15
garbage	$5

hull integrity:

20%	free
50%	$10,000
100%	$50,000

engine:

standard	free
super	$30,000

engine: standard

funds: $10,000

x 5

x 0

x 2

hull: 20%

exit

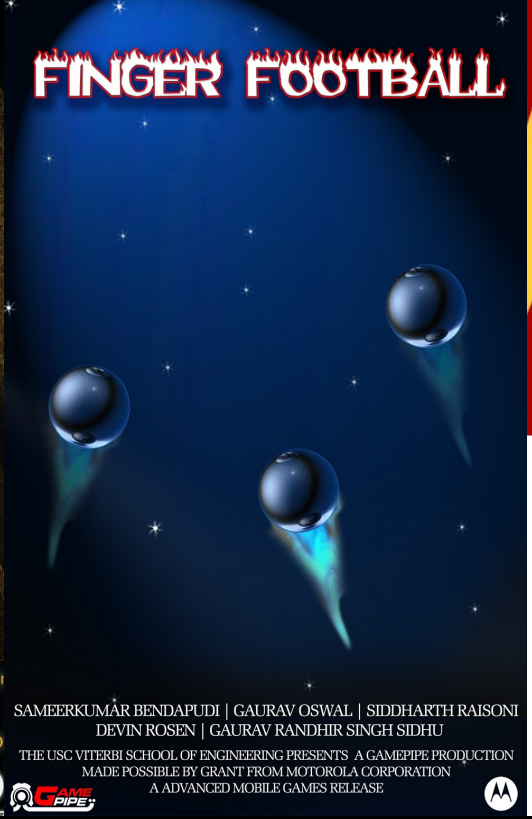
Motorola Collaboration - Games & Next Generation Phones

- Bluetooth
- Wi-fi
- Voice recognition
- Next generation touch screen phones
- How to make mobile games on these phones fun!
  - Donation provided to create CS-526 Advanced Mobile Games course.

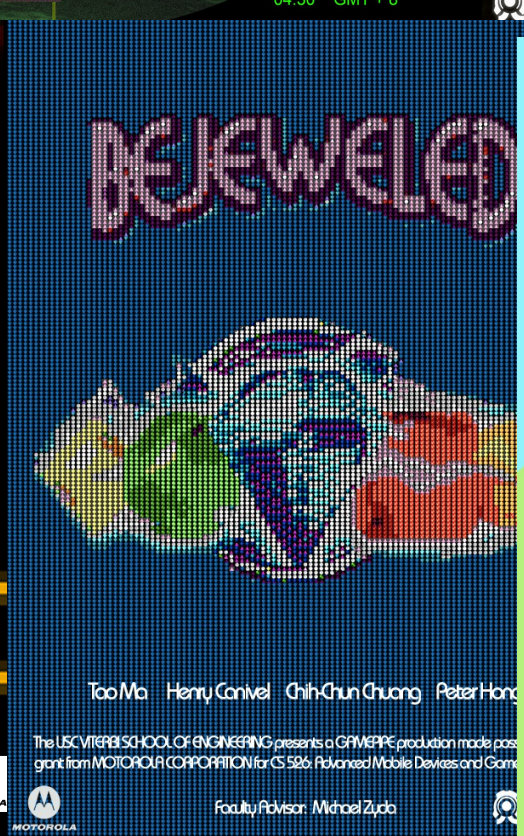
MOTOROLA
GAME PIPE
STARQUAKE
Cheng-Nan Hsieh (James) Chih-Hao Chen (Joseph)
Kai-Yang Hsiao (Sky) Ting-Kuang Wei (Tony)
The USC VITERBI SCHOOL OF ENGINEERING presents a GAMEPIPE production made possible with a grant from MOTOROLA CORPORATION for CS 526: Advanced Mobile Devices and Game Consoles.
Faculty Advisor: Michael Zyda

BattleBoats
319
Deval Bhamare Patrick Bitonti Lily Cheng Liang (Philip) Hong
Sandeep Patel Thomas Preisner Philip Wong
MOTOROLA
The USC VITERBI SCHOOL of ENGINEERING presents a GAMEPIPE production made possible with a grant from the MOTOROLA CORPORATION for CS 526: Advanced Mobile Devices and Game Consoles
04:30 GMT + 8

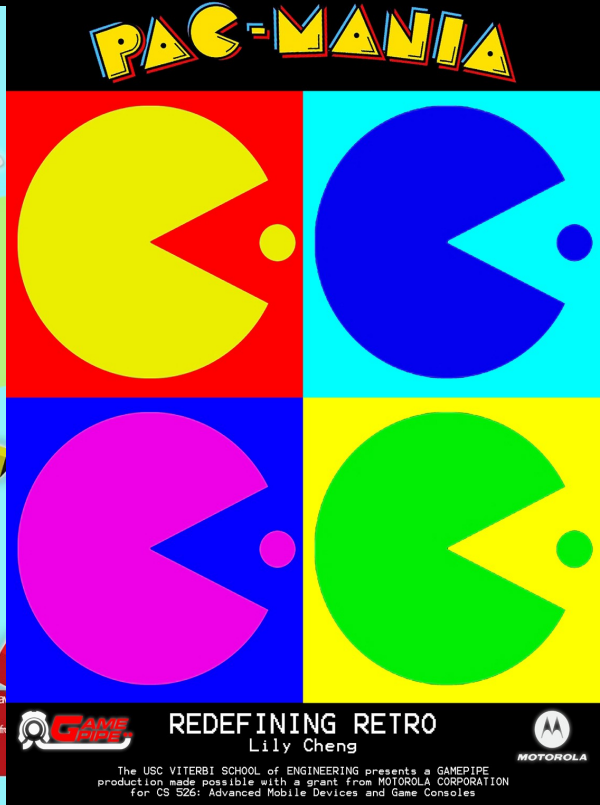
Lily Cheng Michael Flanigan Kwan Woo Park Lei Tang Xiangyu Wu Ji Zhan
The USC VITERBI SCHOOL of ENGINEERING presents a GAMEPIPE production made possible with a grant from MOTOROLA CORPORATIO for CS 526: Advanced Mobile Devices and Game Consoles
GAME PIPE
MOTOROLA


FINGER FOOTBALL
SAMEERKUMAR BENDAPUDI | GAURAV OSWAL | SIDDHARTH RAISONI
DEVIN ROSEN | GAURAV RANDHIR SINGH SIDHU
THE USC VITERBI SCHOOL OF ENGINEERING PRESENTS A GAMEPIPE PRODUCTION
MADE POSSIBLE BY GRANT FROM MOTOROLA CORPORATION
A ADVANCED MOBILE GAMES RELEASE
GAME PIPE
MOTOROLA

SLOOOW IN
STYLUS
Setting fire to a phone near you...
GAME PIPE
MAUNIC DHARIA, PAMELA FOX, ARPAN NANAVATI,
MIN QIN, FRED ZYDA, SUMEET JAKATDAR
MOTOROLA


BEJEWELED
Too Ma Henry Comivel Chih-Chun Chuang Peter Hong
The USC VITERBI SCHOOL OF ENGINEERING presents a GAMEPIPE production made poss
grant from MOTOROLA CORPORATION for CS 526: Advanced Mobile Devices and Game
Faculty Advisor: Michael Zyda
MOTOROLA

DEJÁ HUE
Viraj Tipnis Harikrishna Reghuthama Panicker Ojas Mulay Shraddha Shah Guara
The USC VITERBI SCHOOL OF ENGINEERING presents a GAMEPIPE production made possible with a grant fr
MOTOROLA CORPORATION for CS 526: Advanced Mobile Devices and Game Consoles.
MOTOROLA
Faculty Advisor: Michael Zyda


PAC-MANIA
GAME PIPE
REDEFINING RETRO
Lily Cheng
MOTOROLA
The USC VITERBI SCHOOL of ENGINEERING presents a GAMEPIPE
production made possible with a grant from MOTOROLA CORPORATION
for CS 526: Advanced Mobile Devices and Game Consoles

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Social Models & MMOGs

Models that watch game play & play back

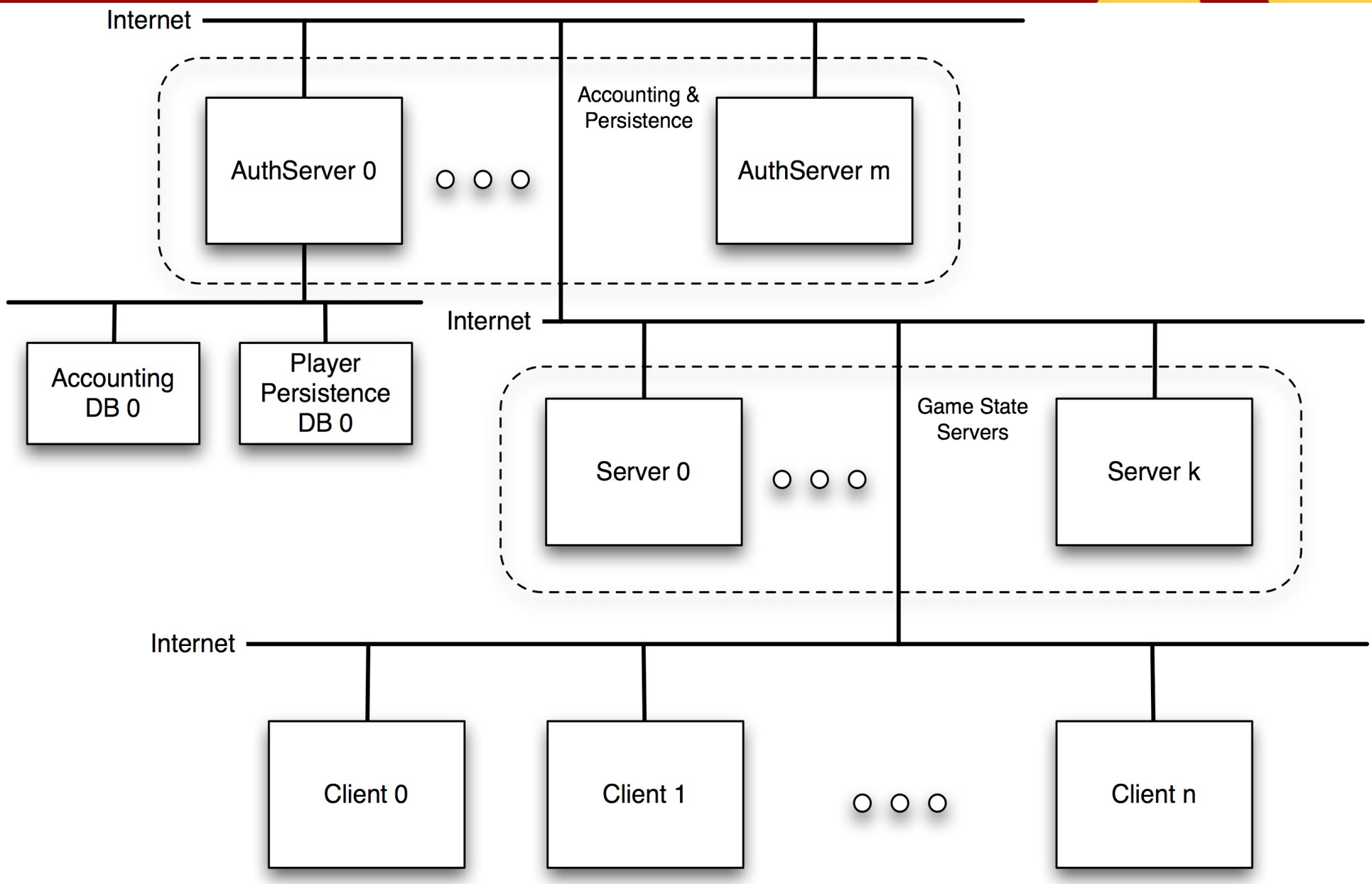
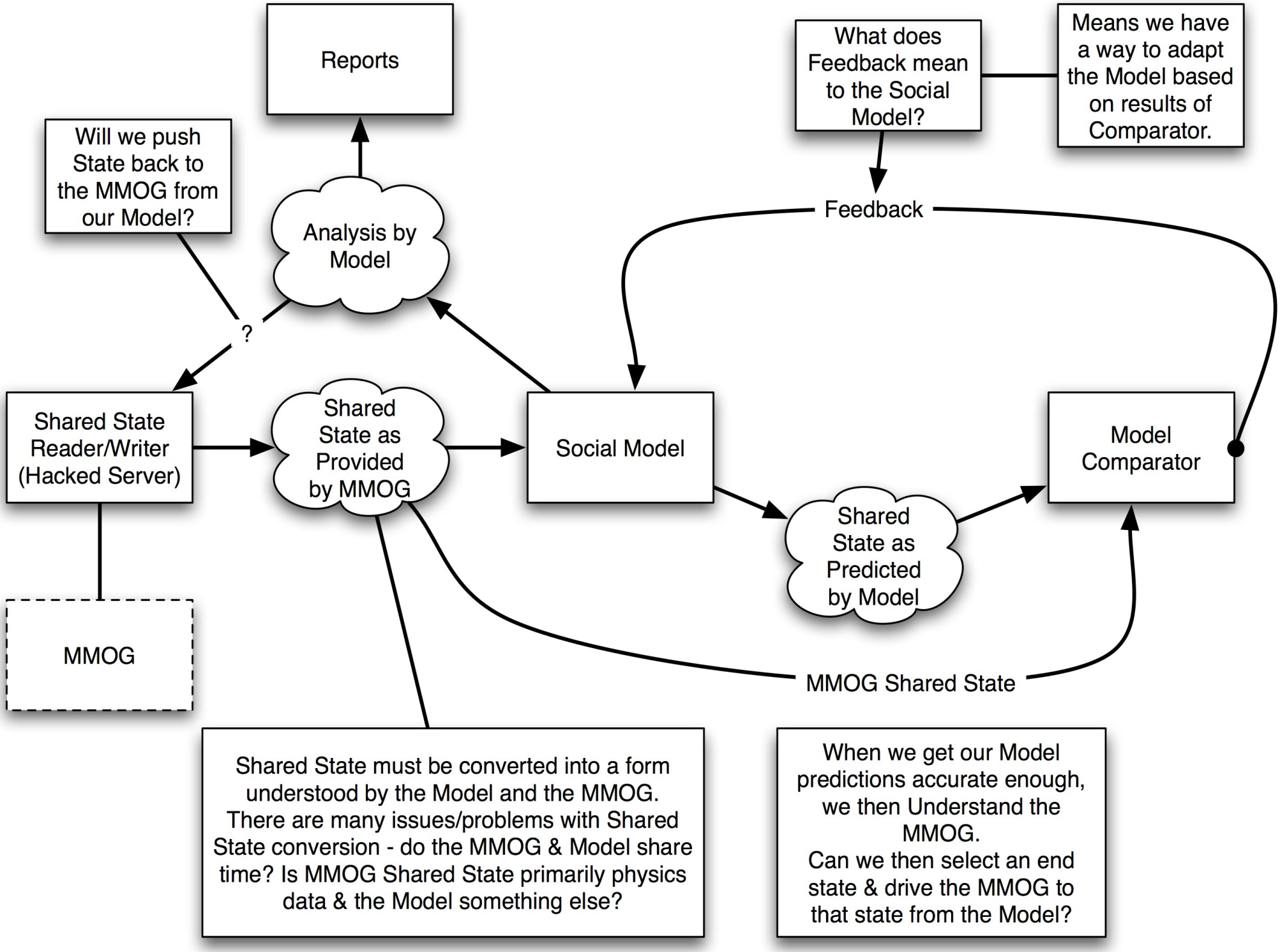


Figure 4-7 Multiplayer, full-out, scalable game architecture.


Reports
What does Feedback mean to the Social Model?
Means we have a way to adapt the Model based on results of Comparator.
Will we push State back to the MMOG from our Model?
Analysis by Model
Feedback
?
Shared State Reader/Writer (Hacked Server)
Shared State as Provided by MMOG
Social Model
Model Comparator
Shared State as Predicted by Model
MMOG
MMOG Shared State
Shared State must be converted into a form understood by the Model and the MMOG. There are many issues/problems with Shared State conversion - do the MMOG & Model share time? Is MMOG Shared State primarily physics data & the Model something else?
When we get our Model predictions accurate enough, we then Understand the MMOG.
Can we then select an end state & drive the MMOG to that state from the Model?

USC Viterbi
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Development Plan for A DHS Massively Multiplayer Online Game (MMOG)

A proposal ...

- The Department of Homeland Security (DHS) is interested in the national STEM-learning-challenge of increasing the number of America's young entering career paths in science, technology, engineering and mathematics.
- An opportunity to reverse that decline is to use the medium of the interactive videogame to familiarize Americans with the technological challenges faced by the Department of Homeland Security.

A proposal ...

- The idea is to build an entertaining game in a fashion similar to that of America’s Army that acts as a strategic communication between the young and DHS.
- We propose to examine the massively, multiplayer online game space as that is the fastest growing segment of the current videogame industry.

Planning the DHS MMOG

We propose to develop a plan and an initial game design for developing a DHS-specific MMOG.

This will be an entertainment game that utilizes DHS-themed material to engage the mind of America's youth with respect to government service, and the underlying DHS technological issues.

Planning the DHS MMOG

- Players of this game will choose character roles, undergo appropriate training, and participate in DHS missions.
- There will be win/lose states and characters will be persistent.
- The proposed game would play across the commercial Internet, and the appropriate technologies and development paths will be identified.
- A proposed budget for the full development of the game and its deployment will also be developed.

Tasks

1. Game design development – we will develop a game treatment, a paper design, for the DHS-MMOG describing game play, and relevant game mechanics.
2. Game technology study & recommendation – we will enumerate the technologies required for the development and deployment of the DHS MMOG, including network infrastructure, user-generated content capabilities, model-embedding potentials, open source versus closed source, etc..

Tasks

3. Testing & user community development plan – we will develop a plan for the deployment of a user-community web presence, and a plan for utilizing that web presence in conjunction with the developed game to ensure that our objective of STEM recruitment is accomplished.
4. Budget Plan – we will develop game development and deployment budgets for the proposed DHS MMOG.

Timeline

We propose to begin this planning effort with the start of the new semester, January 2008, and conclude with a written plan, presentation and budget by the 31st of December 2008.

Proposed Partners

- USC GamePipe Laboratory
- USC Interactive Media Program
- USC Center for Risk and Economic Analysis of Terrorism Events (CREATE)
- USC Integrated Media Systems Center
- Pacific Northwest National Laboratory (PNNL)
- Sandia National Laboratories
- Virtual Heroes

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The USC GamePipe Laboratory

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http://gamepipe.usc.edu